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NATIONAL BUREAU OF STANDARDS REPORT

NBS PROJECT **NBS REPORT**

1002-12-10421 May 1, 1962 7495

Eleventh Progress
Report

on the

Mechanisms of Fire Ignition and Extinguishment

by

E. C. Creitz

Covering the period 1 February to 30 April 1962

for

Bureau of Ships
Department of the Navy

Code 638

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U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

Eleventh Progress Report

Mechanisms of Fire Ignition and Extinguishment

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1. Summary

The activities on the project were confined to developments on the mass spectrometer for sampling and identification of ions in flames.

2. The Mass Spectrometer

In designing the mass spectrometer, it had been reasoned that the ion accelerating voltage would be required to be of saw-tooth wave form, having a rapid decay time, since the resolution of the instrument depended on the slope of the rise-time of the wave. Design of a saw-tooth generator having good linearity and large slope in the wave form and, at the same time, having sufficient power to supply the load presented by the drift tube capacitances proved somewhat of a chore. Furthermore, it was possible for ions to remain in the drift tube for an integral number of accelerator voltage cycles and appear as a "harmonic" mass at the detector. It was evident, however, that the higher "harmonics" gave better resolution than the fundamental. During the quarter, mathematical analysis indicated that an accelerating voltage having sine, rather than saw-tooth form would provide greater resolution because the absolute value of the average slope of a sine wave is just double that of a saw-tooth wave of the same period. It would have the further advantage that two sine waves could be combined in such a way as to produce an accelerating voltage which would eliminate unwanted "harmonics." A trial of sine wave accelerating voltages indicated the mathematical analysis to be correct. The "harmonic" selector was designed and constructed, and is almost ready for trial. A new high-voltage d.c. supply was obtained to permit the study of negative, as well as positive ions, and Cl^{35} and Cl^{37} negative ions have been added to the list of ions detected.

During the next quarter, it is hoped that the "harmonic" selector will be functioning and that work can be started on the determination of the electron capture process associated with certain flame inhibitors.